

#### NOTE

This manual documents the Model 2030A and its assemblies at the revision levels shown in Appendix 7A. If your instrument contains assemblies with different revision letters, it will be necessary for you to either update or backdate this manual. Refer to the supplemental change/errata sheet for newer assemblies, or to the backdating sheet in Appendix 7A for older assemblies.

# 2030A

## Programmable Printer

### Instruction Manual

P/N 504035  
August 1979



# WARRANTY

Notwithstanding any provision of any agreement the following warranty is exclusive:

The JOHN FLUKE MFG. CO., INC., warrants each instrument it manufactures to be free from defects in material and workmanship under normal use and service for the period of 1-year from date of purchase. This warranty extends only to the original purchaser. This warranty shall not apply to fuses, disposable batteries (rechargeable type batteries are warranted for 90-days), or any product or parts which have been subject to misuse, neglect, accident, or abnormal conditions of operations.

In the event of failure of a product covered by this warranty, John Fluke Mfg. Co., Inc., will repair and calibrate an instrument returned to an authorized Service Facility within 1 year of the original purchase; provided the warrantor's examination discloses to its satisfaction that the product was defective. The warrantor may, at its option, replace the product in lieu of repair. With regard to any instrument returned within 1 year of the original purchase, said repairs or replacement will be made without charge. If the failure has been caused by misuse, neglect, accident, or abnormal conditions of operations, repairs will be billed at a nominal cost. In such case, an estimate will be submitted before work is started, if requested.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS, OR ADEQUACY FOR ANY PARTICULAR PURPOSE OR USE. JOHN FLUKE MFG. CO., INC., SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER IN CONTRACT, TORT, OR OTHERWISE.

If any failure occurs, the following steps should be taken:

1. Notify the JOHN FLUKE MFG. CO., INC., or nearest Service facility, giving full details of the difficulty, and include the model number, type number, and serial number. On receipt of this information, service data, or shipping instructions will be forwarded to you.
2. On receipt of the shipping instructions, forward the instrument, transportation prepaid. Repairs will be made at the Service Facility and the instrument returned, transportation prepaid.

## SHIPPING TO MANUFACTURER FOR REPAIR OR ADJUSTMENT

All shipments of JOHN FLUKE MFG. CO., INC., instruments should be made via United Parcel Service or "Best Way" prepaid. The instrument should be shipped in the original packing carton; or if it is not available, use any suitable container that is rigid and of adequate size. If a substitute container is used, the instrument should be wrapped in paper and surrounded with at least four inches of excelsior or similar shock-absorbing material.

## CLAIM FOR DAMAGE IN SHIPMENT TO ORIGINAL PURCHASER

The instrument should be thoroughly inspected immediately upon original delivery to purchaser. All material in the container should be checked against the enclosed packing list. The manufacturer will not be responsible for shortages against the packing sheet unless notified immediately. If the instrument is damaged in any way, a claim should be filed with the carrier immediately. (To obtain a quotation to repair shipment damage, contact the nearest Fluke Technical Center.) Final claim and negotiations with the carrier must be completed by the customer.

The JOHN FLUKE MFG. CO., INC., will be happy to answer all applications or use questions, which will enhance your use of this instrument. Please address your requests or correspondence to: JOHN FLUKE MFG. CO., INC., P.O. BOX 43210, MOUNTLAKE TERRACE, WASHINGTON 98043, ATTN: Sales Dept. For European Customers: Fluke (Holland) B.V., P.O. Box 5053, 5004 EB, Tilburg, The Netherlands.

\*For European customers, Air Freight prepaid.

**John Fluke Mfg. Co., Inc., P.O. Box 43210, Mountlake Terrace, Washington 98043**

Rev. 4/80

## Section 1

## Introduction &amp; Specifications

## 1-1. INTRODUCTION

1-2. The Model 2030A Programmable Printer is a 20-character thermal line printer designed as a recording peripheral device for use with digital measurement instruments. It will print up to 20 characters per line; the character set includes the standard 64 character ASCII upper-case set, plus special codes to print a degree symbol, Greek letters Mu ( $\mu$ ) and Omega ( $\Omega$ ), and lower case f, k, m, n, p, s, and z. All special codes are listed in Table 1-1.

1-3. A maximum of nine Fluke PTI format instruments may be connected to the 2030A Programmable Printer through two Model Y2034 Interconnect Accessories. The printer scans all nine input instruments and prints information received from each during each print cycle. A print cycle may be initiated by the SINGLE PRINT switch, the CONTINUOUS PRINT switch, or by Interval Print front panel programming. A print cycle may also be initiated from a remote switch through a rear panel connector.

1-4. In addition to printing information supplied by the input digital instruments, the 2030A Programmable Printer will supply printed time annotation (Real Time, Elapsed Time, or Interval Time) and a six-digit numeric header annotation at the start of each print cycle.

1-5. One test instrument input may be selected through a special address feature for use with a limits comparison function, a math function, a special annotation function, or a trace print mode. The limits comparison function initiates a print cycle when the input data exceeds or falls below operator-set limits; the math function scales the selected input using operator-entered constants; the special annotation function allows the operator to enter a maximum of four annotation characters for the selected instrument input. In the trace print mode, the printer produces a strip chart reflecting input data variations.

1-6. The Model 2030A Programmable Printer operates using one of three input power sources. Two input ac line voltage ranges are switch selectable: 90 to 132V ac or 180 to 250V ac. Either ac line range requires a frequency between 47 Hz and 440 Hz. One rear panel connector is provided for ac line voltage input. Refer to Section 4 of this manual for instructions on verifying or changing the input line voltage switch settings. The 2030A Programmable Printer will also operate from a +12V dc supply. One rear panel connector containing two screw-type terminals is provided for a dc voltage input. The terminals are marked for polarity.

1-7. Communication between the 2030A Programmable Printer and an input instrument, or the Model Y2034 Interconnect Accessory, is through a 36-pin amp "Champ" Series connector. The printer connector is male. Data, address, and handshake signals in the PTI format (a unique Fluke format) are transferred through the connector in either a handshake or clocked mode.

Table 1-1. Special Printer Codes

ASCII CHARACTER CODE	PRINTER RESPONSE
Control J (Line Feed)	Terminate Input Data String
Control L (Form Feed)	Space One Line
Lower Case d	Degree Symbol ( $^{\circ}$ )
Lower Case f	Lower Case f
Lower Case k	Lower Case k
Lower Case m	Lower Case m
Lower Case n	Lower Case n
Lower Case p	Lower Case p
Lower Case r	Omega Symbol ( $\Omega$ )
Lower Case s	Lower Case s
Lower Case u	Micro Symbol ( $\mu$ )
Lower Case z	Lower Case z

1-8. Physically, the Model 2030A Programmable Printer consists of three circuit boards mounted in a PTI (Portable Test Instrument) Case. The three circuit boards are: the Keyboard, the Input Interface Board, and the Printer PCB. The lightweight, durable plastic, PTI case can be stacked and latched to other instruments in PTI cases to form a test system.

1-9. No options are available for the 2030A Programmable Printer. There are, however, several accessories. These are described in Section 6 of this manual, the Option and Accessory Information section, and listed in Table 1-2.

### 1-10. SPECIFICATIONS

1-11. Specifications for the Model 2030A Programmable Printer are listed in Table 1-3.

Table 1-2. Accessories

ACCESSORY	DESCRIPTION
Y2028	Interface (BCD to PTI)
Y2034	Interconnect (5 Input – 1 Output)
Y7203	Cable Assembly – 2 Foot – 36-pin
Y7204	Cable Assembly – 5 Foot – 36-pin
Y2016	Rack Panel

Table 1-3. Specifications

<b>OPERATING CHARACTERISTICS</b>	
Type	Thermal, 20-column
Character Set	64-Upper case ASCII plus special characters listed in Table 1-1.
Scan Capability	Maximum of nine instruments automatically (requires two Y2034 Interconnect Accessories).
Print Speed	Three lines per second.
Scan Speed	Three instruments per second (maximum).
Line Spacing	Approximately 2.4 lines per cm (6 lines per inch).
Print Modes	Single, Continuous, Trace, Interval, Interval Trace, Interval Limit, Remote.
Time Selection	Elapsed Time (ET), Real Time (RT), Elapsed Time-Interval (ET & IT), Real Time-Interval (RT & IT).
<b>ENVIRONMENTAL REQUIREMENTS</b>	
Operating Environment	
Temperature	0°C to 50°C (32°F to 122°F).
Humidity	95% - 0°C to 25°C (32°F to 77°F). 75% - 25°C to 40°C (77°F to 104°F). 45% - 40°C to 50°C (104°F to 122°F).
Storage Environment	
Instrument	-20°C to +70°C (-4°F to +158°F).
Paper	22°C, 50% RH, (90% contrast maintained for one year). 45°C, 80% RH, (90% contrast maintained for one week).
Shock and Vibration	Meets MIL-T-2800 Specifications.
<b>PROGRAMMABLE PARAMETERS</b>	
Time	6-digit Real Time (HR:MIN:SEC).
Interval	6-digit Interval Time (HR:MIN:SEC).
Header	6-digit Reference Number.
Math	Scales one instrument input data.
A	6-digit constant used in Math and Trace.
B	6-digit constant used in Math and Trace.
HI LIM	6-digit high limit values.
LO LIM	6-digit low limit values.
SPEC ADR	1-digit special address
UNITS	4 alphanumeric characters, 2 or 3 digit code to select each character.

Table 1-3. Specifications (cont)

<b>GENERAL SPECIFICATIONS</b>	
<b>Weight</b>	Approximately 9 pounds (with paper).
<b>Power</b>	90 to 132V ac, 48 to 440 Hz.
	180 to 250V ac, 48 to 440 Hz.
	11 to 15V dc
	40 Watts maximum.
<b>Case Size</b>	20.45 cm W x 13.08 cm H x 32.69 cm L (8.05 in. x 5.15 in. x 12.85 in.) See Figure 1-1.
<b>Paper Advance Type</b>	Belt drive - stepping motor.
<b>Paper Type</b>	Thermal sensitive - 2.5 inches wide x 240 feet long. (3M Type 162.)
<b>Plug Compatible</b>	Thermometers: Fluke 2180A and 2190A
	Scanner: Fluke 2300A
	Counters: Fluke 7200A Series
	DVM: Fluke 8920A
	DMMs: Fluke 8600A, 8800A, 8810A, (All DMMs and DVMs require Option -521 for use with the 2030A Printer.)
	Interconnect Accessory: Fluke Y2034
<b>Protection Class 1</b>	Interface (BCD to PTI): Fluke Y2028
	Relates solely to insulation or grounding properties as defined in IEC 348.

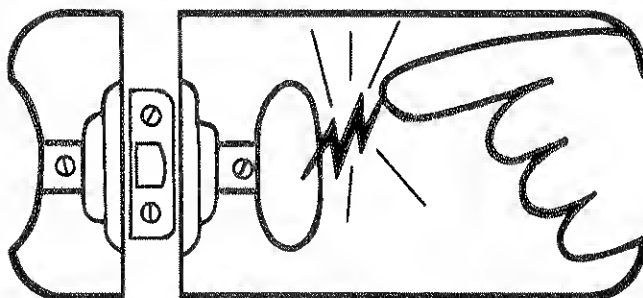




# static awareness



A Message From  
**John Fluke Mfg. Co., Inc.**

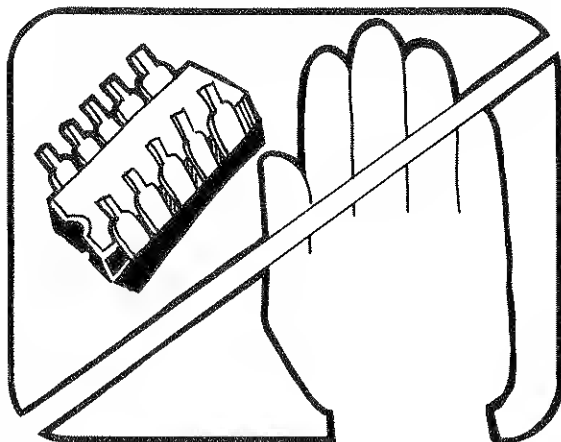


Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

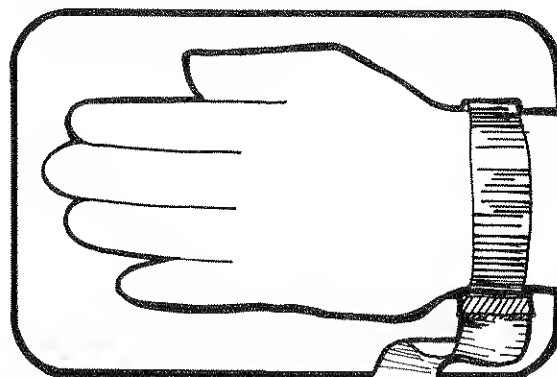
1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, and packaging and bench techniques that are recommended.

The Static Sensitive (S.S.) devices are identified in the Fluke technical manual parts list with the symbol "⊗".

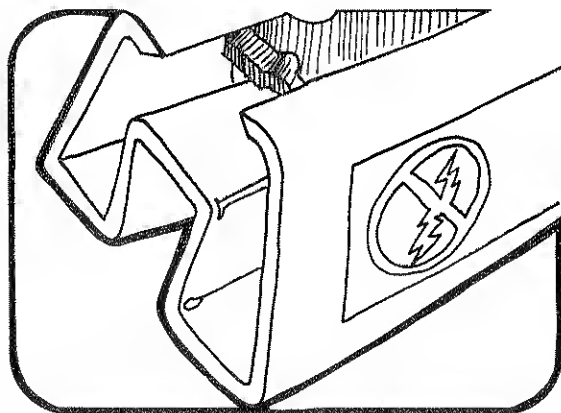
The following practices should be followed to minimize damage to S.S. devices.



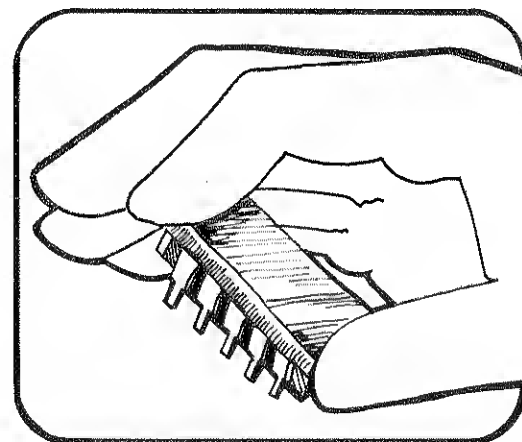
1. MINIMIZE HANDLING



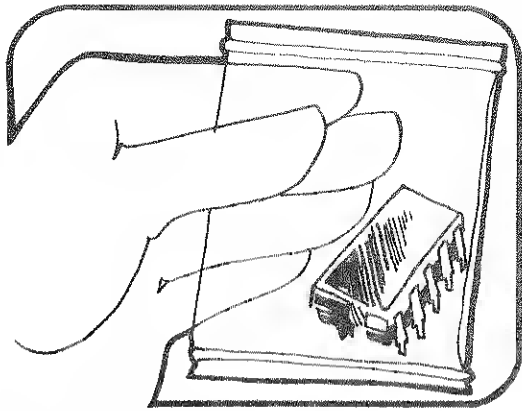
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES



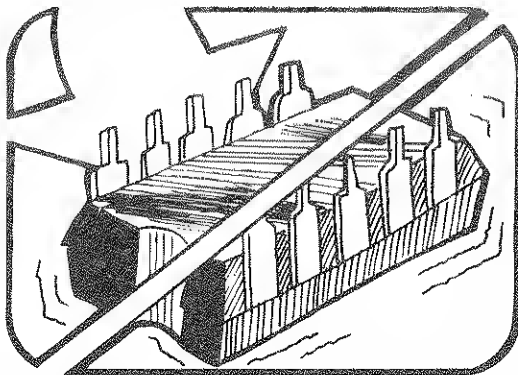
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



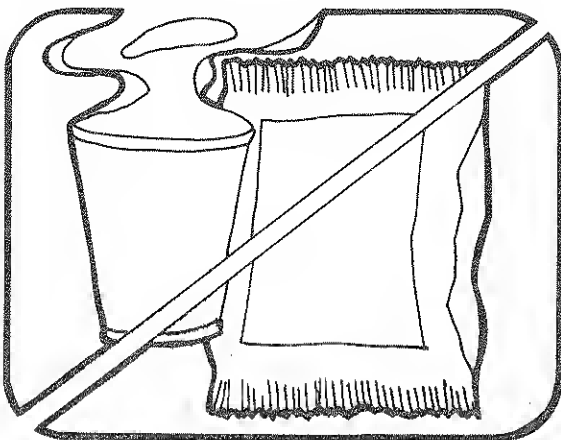
4. HANDLE S.S. DEVICES BY THE BODY



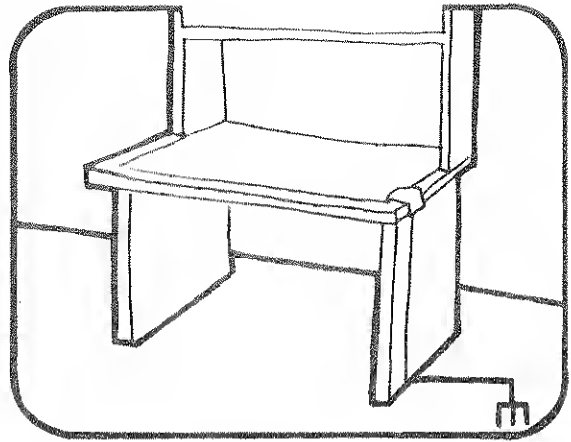
5. USE ANTI-STATIC CONTAINERS FOR HANDLING AND TRANSPORT



6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE



7. AVOID PLASTIC, VINYL AND STYROFOAM IN WORK AREA



8. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION
9. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.
10. ONLY GROUNDED TIP SOLDERING IRONS SHOULD BE USED.

Anti-static bags, for storing S.S. devices or pcbs with these devices on them, can be ordered from the John Fluke Mfg. Co., Inc.. See section 5 in any Fluke technical manual for ordering instructions. Use the following part numbers when ordering these special bags.

John Fluke Part No.	Bag Size
453522	6" x 8"
453530	8" x 12"
453548	16" x 24"
454025	12" x 15"



## Section 2

# Operating Instructions

### 2-1. INTRODUCTION

2-2. This section of the manual contains information regarding installation and operation of the Model 2030A Programmable Printer. It is recommended that the contents of this section be read and understood before any attempt is made to operate the instrument. Should difficulties arise during operation, please contact your nearest Fluke Technical Service Center, or the John Fluke Mfg. Co., Inc.; P.O. Box 43210, Mountlake Terrace, WA 98043; telephone (206) 774-2211. A list of Technical Service Centers is located in Section 7 of this manual.

### 2-3. SHIPPING INFORMATION

2-4. Model 2030A Programmable Printers are packaged and shipped in a foam-packed container. Upon receipt of the instrument, a thorough inspection should be made to reveal any possible shipping damage. Special instructions for inspection and claims are included on the shipping carton.

2-5. If reshipment of the instrument is necessary, the original container should be used. If the original container is not available, a new one can be obtained from the John Fluke Mfg. Co., Inc. Please include the instrument model number when requesting a new shipping container.

### 2-6. INPUT POWER

2-7. Model 2030A Programmable Printers operate with any of three possible input voltages. Two ac line voltage ranges are switch selectable: 90 to 132V ac or 180 to 250V ac. Either ac voltage selected must be of a frequency between 47 Hz and 440 Hz. Refer to Section 4 of this manual for instructions on verifying or changing the input line voltage switch settings. The printer will also

operate from a +12V dc voltage supply. External 12V dc connections are provided on the rear panel. The connections are screw-type terminal block connections, and they are marked for polarity. Both the ac and dc inputs may be connected simultaneously; if the ac input should fail, the printer will switch automatically to dc operation.

#### CAUTION

**Before connecting the 2030A Programmable Printer to the local ac line voltage, verify that the input voltage switch setting matches the local line voltage. Refer to the rear panel decal.**

2-8. The rear panel ac connector is a three-prong, U-ground connector which permits the printer to be connected, through the power cord, to the applicable line voltage. The offset ground prong on this connector should be connected, through the power cord, to a high quality earth ground.

### 2-9. INSTALLATION

2-10. Model 2030A Programmable Printers are packaged and installed in PTI (Portable Test Instrument) cases. These cases are stackable, and they may be latched together, allowing the operator to fasten the printer together with several accessories and test instruments to form one easily transportable system. Maximum weight for one stacked unit system is 40 pounds.

2-11. To prepare the printer for operation, first verify that the input voltage select switch on the Printer PCB is in the correct position for the local line voltage. Refer to Section 4 of this manual for access information. Plug the input line power cord into the applicable power source, or connect a +12V dc source to the 12V dc input connector block. Verify that all connected test instruments have the

correct preset address. If only one test instrument is to be used with the printer, connect the test instrument to the rear panel, 36-pin, printer I/O connector. Cable accessory Y7203 or Y7204 may be used for this connection. If more than one test instrument is to be used with the printer, connect the Interconnect Accessory, Y2034, to the printer rear panel I/O connector through Cable Assembly Y7203 or Y7204. Then connect the desired test instruments to the Interconnect Accessory using additional cable assembly accessories as shown in Figure 2-1. Up to five test instruments may be used with one Y2034. Nine test instruments may be connected through two Y2034 Interconnect Accessories.

## 2-12. OPERATING FEATURES

2-13. The 2030A controls, indicators, and connectors are shown in Figure 2-2 and described in Table 2-1.

## 2-14. OPERATING NOTES

2-15. The following paragraphs describe various conditions that could effect 2030A Programmable Printer operation. They also describe minor, operator-performed, periodic, service procedures. The operator should familiarize himself with these conditions and procedures prior to operating the 2030A Programmable Printer.

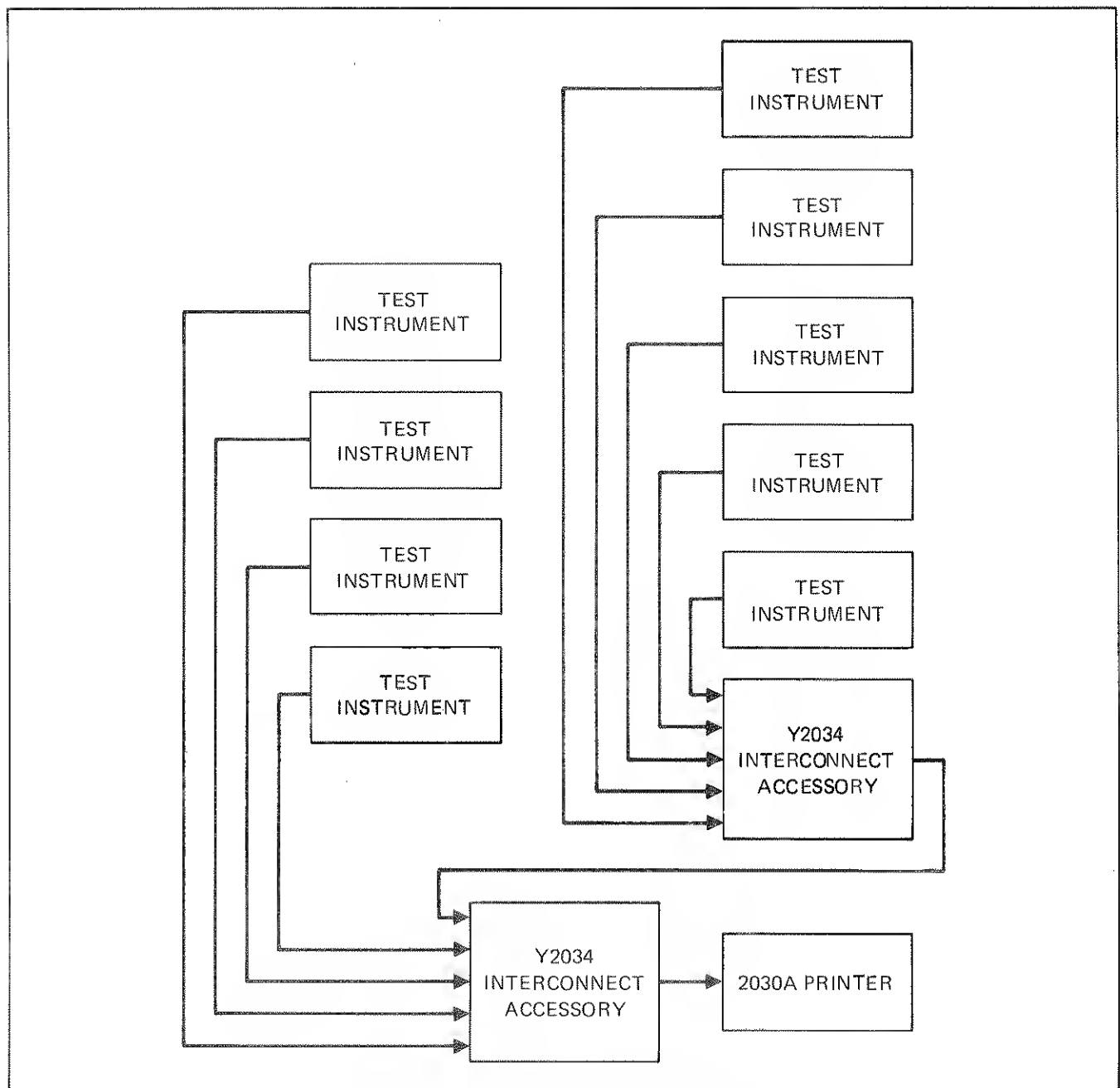


Figure 2-1. Multiple Test Instrument Connection

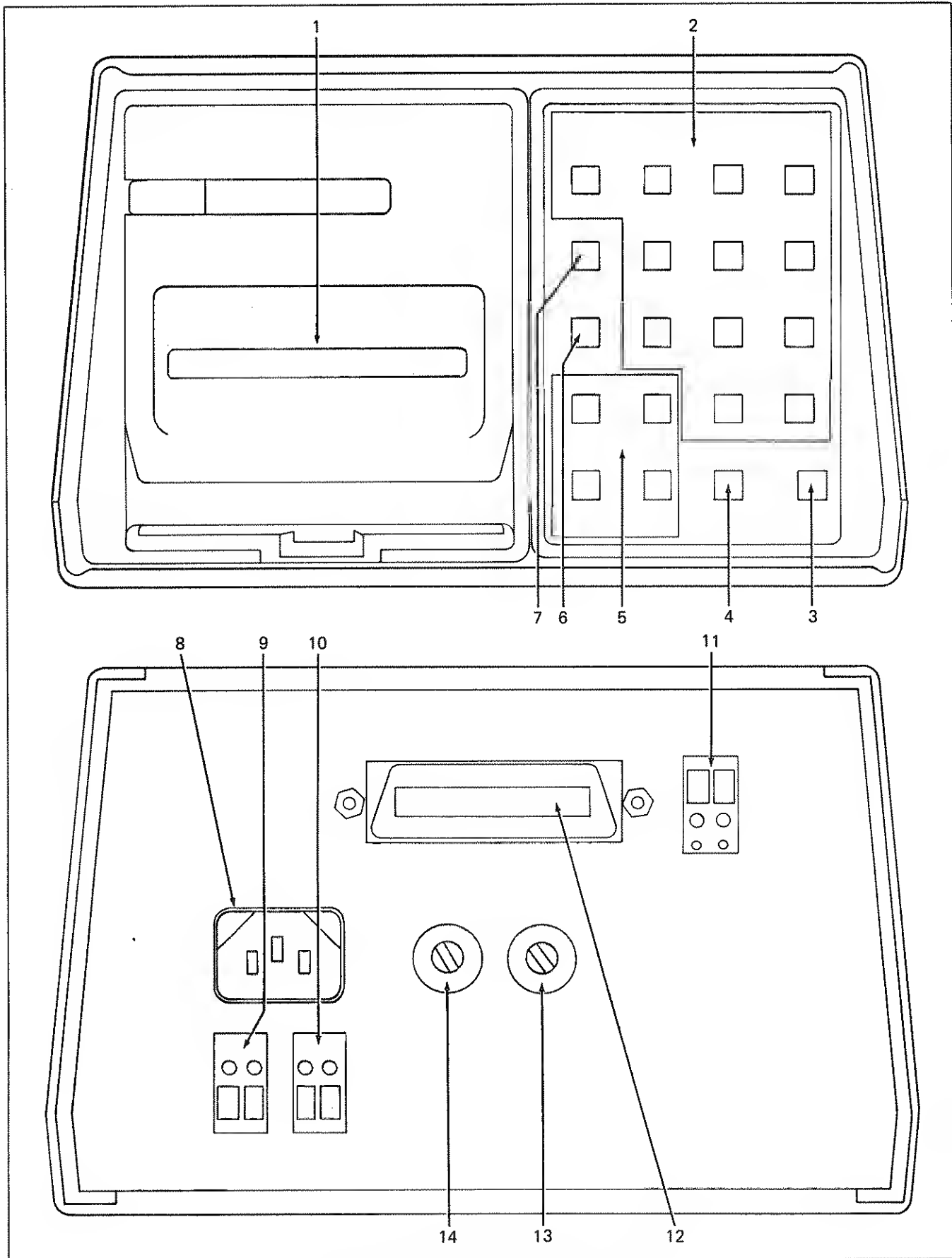


Figure 2-2 . Controls, Indicators, and Connectors

Table 2-1. Controls, Indicators, and Connectors

REF. NO.	NAME	FUNCTION
1	Print Unit	Twenty-column thermal line printer. Provides hard copy.
2	PROGRAMMING Keys	<p>Twelve keys used to program digits and select program operational functions.</p> <p>f: Function selection. Used to select operation functions.</p> <p>7/TIME: Programs digit 7 or selects real TIME for programming.</p> <p>8/INTERVAL: Programs digit 8 or selects INTERVAL time for programming.</p> <p>9/HEADER: Programs digit 9 or selects HEADER number for programming.</p> <p>4/A: Programs digit 4 or selects A constant for programming.</p> <p>5/B: Programs digit 5 or selects B constant for programming.</p> <p>6/MATH: Programs digit 6 or selects MATH function for programming.</p> <p>1/HI LIM: Programs digit 1 or selects high limit for programming.</p> <p>2/LO LIM: Programs digit 2 or selects low limit for programming.</p> <p>3/UNITS: Programs digit 3 or selects annotation for programming.</p> <p>0: Programs digit 0.</p> <p>—/SPEC ADR: Programs dash or minus (—) character or selects special address for programming.</p>
3	POWER ON/OFF	Switches power to printer circuitry.
4	PAPER ADVANCE	Advances print unit paper.
5	PRINT Keys	<p>Four switches used to establish PRINT mode.</p> <p>CONT: Initiates continuous scan and print sequences until manually reset.</p> <p>SINGLE: Initiates a single scan and print sequence.</p> <p>TRACE: Initiates a trace of print dots using A and B constants to scale input data.</p> <p>INTERVAL: Initiates scan and print sequence at the time interval established by programming.</p>
6	ENTER	Enters programmed value.
7	DECIMAL/STOP	Stops all PRINT modes except continuous or programs a decimal point.
8	LINE VOLTAGE CONNECTOR	3-prong line voltage connector.
9	AUX SUPPLY 12V dc	Connections for 12V external power input.
10	PRINT COMMAND	Connections for remote print input.
11	LIMITS	Connections for external alarm device.
12	DATA INPUT	Connection for input test instrument or Y2028.
13	F2	External 12V dc fuse.
14	F1	Line ac fuse.

## 2-16. Remote Print Operation

2-17. An external device may initiate a print cycle through the PRINT COMMAND connector on the printer rear panel. A switch closure between the two connector terminals initiates a single print cycle; a maintained switch closure initiates continuous print cycles as long as it is maintained.

## 2-18. Fuse Replacement

2-19. The ac line input and external dc input are individually fuse protected. Both fuses are readily accessible from the outside of the rear panel. The ac line input fuse (F1) should be replaced with a ½ ampere slo-blo fuse if the 90 to 132 volt input range is in use; use a ¼ ampere replacement if the 180 to 250 volt input range is in use. The external dc input fuse (F2) requires a 5 ampere slo-blo replacement.

## 2-20. Paper Replacement

2-21. Paper used in the 2030A Programmable Printer is 2½ inches wide, and it is supplied in 240 foot rolls. The recommended paper type is 3M-162. It may be ordered from John Fluke Mfg. Co., Inc., or from the 3M Corporation. Use of other paper types may result in paper feed problems. Use the following procedure to install paper in the 2030A:

1. Lift the latch located under the front of the print unit cover to release the print unit.
2. While holding the latch up, pull the print unit out to the stop point.
3. Lift the empty cardboard roll and plastic dowel pin out of the print unit housing.
4. Place a new roll of paper on the dowel pin, and reinstall the paper and dowel pin in the print unit housing.
5. Insert the end of the paper roll in the slot at the inside front of the print unit housing, and push the PAPER ADVANCE switch on the printer front panel to feed the paper through the printhead area.

## 2-22. Function Programming

2-23. Ten printer functions and two print modes may be initiated using key f in the PROGRAMMING group. Leading zeros need not be entered when entering a new value. For example: to enter an interval time of 20 seconds, push key f, INT TIME, 2, 0, and ENTER. To enter an interval time of 2 minutes, push key f, INT TIME, 2, 0, 0, and ENTER. Key f, in conjunction with ten additional PROGRAMMING group keys, initiates the following functions. (Refer to Table 2-2, Glossary.)

1. TIME - When the TIME key is pushed following the f key, the 2030A will print elapsed time (ET XX:XX:XX) or real time (RT XX:XX:XX). The printer is initialized in elapsed time. To establish real time operation, push f, then TIME, followed by two digits representing the hour (00 to 24), two digits representing the minutes (00 to 59), and two digits representing the seconds (00 to 59). Then push the ENTER key. Entering a time of 0 places the printer in elapsed time operation again. Pressing any non-stop print mode key resets the elapsed time clock to zero.

2. INTERVAL - When the INTERVAL key is pushed following the f key, the 2030A will print the interval time (IT XX:XX:XX). To establish a new interval time, push key f, followed by the INTERVAL key, then six (or less) digits denoting the new interval time, then push ENTER. Intervals from 00:00:01 to 99:59:59 are possible.

3. HEADER - When the HEADER key is pushed following the f key, the 2030A will print the HEADER number (HD XXXXXX). To establish a new header number, push the f key, then the HEADER key, then six (or less) digits denoting the new header number, then push ENTER. The header number can be used for a test number, lot number, day code, or any other customer information.

4. A - When the A key is pushed following the f key, the 2030A will print the six digit A constant with a floating decimal point, (A XXX.XXX). To establish a new A constant, push the f key, then the A key, then six (or less) digits denoting the new A constant and a decimal point if necessary, then push ENTER. The decimal point may be entered at any point in the constant. (In Trace print mode, only four decimal places are allowable.)

5. B - When the B key is pushed following the f key, the 2030A will print the six digit B constant (B -XXXXXX). To establish a new B constant push key f, then key B, then six digits (or less) denoting the new constant. If the new B constant is a negative value, push the minus (-) key at any time before ENTER. Push the ENTER key. The B constant must be a non-decimal number. The B constant is used in the scaling equation.

6. MATH - When the MATH key is pushed following the f key, the math function will be set if it is in a reset condition; if the math function is in a set condition when the keys are pushed, it will be reset. The 2030A will print MATH SET if the math function is set. It will print MATH RESET if the math function is reset. When the math function is set, the scaling equation will be applied to the data

from the test instrument selected through the special address. The operator-entered A and B constants are used in the scaling equation  $P = A(D-B)$ .

#### NOTE

$P$  = Printed value

$A$  &  $B$  = user defined constants

$D$  = Displayed numeric value

7. HI LIM - When the HI LIM key is pushed following the f key, the 2030A will print the six digit high limit (HL XXXXXX). A minus sign (-) may be printed before the digits if the high limit is a negative value. To establish a new high limit, push the f key, then the HI LIM key; push the - (minus) key at any time, if necessary, then six (or less) digits denoting

the new limit, then push ENTER. High and low limits are used only in the interval limit print mode, and they apply only to the selected special address instrument. Limits comparison is performed using the printed number, ignoring the decimal point.

8. LO LIM - When the LO LIM key is pushed following the f key, the 2030A will print the six digit low limit (LL XXXXXX). A minus sign (-) may be printed before the digits if the low limit is a negative value. To establish a new low limit, push the f key, then the LO LIM key; push the - (minus) key at any time, if necessary, then six digits (or less) denoting the new limit, then push the ENTER key. Low limit is used only in the interval limit print mode, and it applies only to the selected special address instrument.

Table 2-2. Glossary

AUTOMATIC ANNOTATION GLOSSARY		MATH FUNCTION GLOSSARY	
SYMBOL	MEANING	TERM	MEANING
A	User entered constant A	A	User entered constant
B	User entered constant B	B	User entered constant
BUS DOWN	Diagnostic	D	Measurement instrument displayed value
ET	Elapsed time		Measurement instrument displayed value ignoring decimal point
IMPROPER ENTRY	Diagnostic	D*	
IT	Time Interval	DELTA	Algebraic difference
HD	Header Number	% DELTA	Percent algebraic difference
HL	High Limit	D <sub>HI</sub>	Highest displayed value
LL	Low Limit	D <sub>HI</sub> *	Highest displayed value ignoring decimal point
m	Math function in use	D <sub>LO</sub>	Lowest displayed value
m MATH SET	Math function initiated	D <sub>LO</sub> *	Lowest displayed value ignoring decimal point
MATH RESET	Math function terminated	P	Printed value
RT	Real Time	P <sub>HI</sub>	Highest printed value
SA	Special Address	P <sub>LO</sub>	Lowest printed value
STOP	Print mode terminated	REF	User defined reference value
UN	Programmed Engineering Units	REF*	User defined reference value ignoring decimal point
UNITS RESET	Units register cleared		
>	Printed number is above High Limit (or window)		
<	Printed number is below Low Limit		
^	Math caused overflow		

9. **UNITS** - When the UNITS key is pushed following the f key, the 2030A will print four special annotation characters in the four right hand printer columns, if they have been set (UN XXXX). The UNITS annotation overwrites the last four data columns. If the units function is reset, the 2030A will print units reset (UNITS RESET). To establish new units annotation characters, push the f key, then push the UNITS key. Refer to Table 2-2. Push the two or three digit code for the first annotation character, then press the - (minus) key; enter the second character code and press the - (minus) key; enter the third character code and press the - (minus) key; enter the fourth character code and press the - (minus) key; then press the ENTER key. To enter a blank space in place of any annotation character, press the minus key a second time instead of entering a character code. If the ENTER key is pushed after the first, second, or third character code, the remaining character(s) will be entered as blanks. To reset the units annotation, press f, then UNITS, then 0, then ENTER. Units annotation is applicable only to the test instrument selected through the special address.

10. **SPEC ADR** - When the SPEC ADR key is pushed following the f key, the 2030A will print the single digit special address (SA X). To establish a new special address, push key f, then key SPEC ADR, then push a single digit denoting the new special address, then push the ENTER key. The math, limits, trace print mode, and units functions apply only to the instrument input selected through SPEC ADR. To disable the special address function, push f, the SPEC ADR, the digit 0, then ENTER.

#### NOTE

*Header information, limits, and both math constants are printed with leading zero suppression.*

### 2-24. Math Function Error Calculation

2-25. Math function equation errors may be induced by rounding-off the A and B constants to the required six figures. These errors may be calculated as percentages of the printed value as detailed in Table 2-4. In calculating A constant round-off errors, the number of digits to the left of the decimal point (m) will always equal 4 in any trace mode calculation. In error calculation for deviation or percent deviation scaling, the highest printed value (Ph) is the highest expected deviation, or the highest expected percent of deviation. An error induced by the B constant is possible only if the lowest printed value (Pl) is not equal to zero.

Table 2-3. Character Codes

CODE	CHAR	CODE	CHAR
32	:	69	E
33	;	70	F
34	"	71	G
35	#	72	H
36	\$	73	I
37	%	74	J
38	&	75	K
39	'	76	L
40	(	77	M
41	)	78	N
42	*	79	O
43	+	80	P
44	,	81	Q
45	-	82	R
46	.	83	S
47	/	84	T
48	0	85	U
49	1	86	V
50	2	87	W
51	3	88	X
52	4	89	Y
53	5	90	Z
54	6	91	[
55	7	92	\
56	8	93	]
57	9	94	^
58	:	95	_
59	<	100	!
60	>	102	"
61	=	107	#
62	<	109	\$
63	>	110	%
64	@	112	^
65	A	114	^
66	B	115	^
67	C	117	^
68	D	122	^

### 2-26. Print Mode Programming

2-27. As previously stated, there are two print modes which can be initiated using the f key. There are also four print modes which can be initiated without use of the f key. If any print mode other than CONT is in use, a new print mode may be initiated at any time. When a new print mode is initiated, the printer will stop scanning, print the word STOP, then start the selected new print mode. The following six print modes are possible:

1. **SINGLE** - When the SINGLE key is pushed, the 2030A scans all connected test instruments and prints the information supplied. The SINGLE key must be pressed again for each subsequent scan and

print sequence. The single print mode may also be initiated through the rear panel PRINT COMMAND connector. A negative-true logic signal or a relay closure to ground is required as input.

2. **CONT** - When the CONT key is pushed in, the 2030A scans all connected test instruments and prints the information supplied. Since the CONT key remains in until manually reset, the 2030A immediately initiates another scan and print sequence at the end of each preceding sequence. To terminate the continuous print mode, press and release the CONT key, setting it to the out position.

3. **INTERVAL** - When the INTERVAL key is pushed, the 2030A scans all test instruments connected, at the programmed time interval, and prints the information supplied. Header, interval time, and elapsed time or real time information is also printed when the INTERVAL mode is initiated. On succeeding prints, only interval time or real time is printed before the data. To terminate the interval print mode, press key f, then press the STOP key.

4. **INT LIM** - When the f key is pushed, followed by the INT LIM key, the interval and limit print mode is established. The 2030A scans all connected instruments and prints all information just as it does in the interval print mode. When the 2030A is not performing an interval print sequence, it monitors the instrument selected by SPEC ADR. If the SPEC ADR instrument information goes below the operator programmed low limit, or above the operator programmed high limit, the 2030A prints the instrument address, real time or elapsed time, and a symbol indicating which limit was crossed (< = low; > = high; space = return within limits) followed by the instrument data. Limits

comparison is performed on the absolute numeric data value, ignoring the decimal point. If the math function is in use, limits comparison is performed after the math scaling, using the scaled data. The 2030A also prints the special address information when the information goes back within the programmed limits, but the symbol indicating which limit was exceeded is deleted. When a limit is exceeded, the 2030A supplies an alarm output at the rear panel LIMITS connector. When the input information goes back to a value within the limits, the alarm output is turned off.

#### NOTE

*If no instrument, or a 2300 Scanner, is connected to the selected SPEC ADR input, or if a SPEC ADR of 0 is selected, the 2030A prints the words IMPROPER ENTRY followed by the SPEC ADR (bbbb X).*

5. **TRACE** - When the TRACE key is pushed, the 2030A prints a dot trace, 100 dots wide, reflecting variations in input data from the instrument selected by SPEC ADR. The left trace edge is established by entering constant B; the trace span is established by entering constant A. (In TRACE, constant A must not have more than four decimal places. Five or six decimal place entries result in IMPROPER ENTRY when the TRACE key is pushed.) If the input information goes off scale, the 2030A supplies an alarm output at the rear panel LIMITS connector. It also prints one alphanumeric alarm printout which includes a symbol (< = left; > = right) that indicates the scale edge exceeded. When the input information returns on scale, the alarm output is turned off and an alphanumeric print out with no limit symbol occurs. TRACE dots are printed at 1 second intervals; an event marker is printed every sixtieth reading.

Table 2-4. Math Function Error Calculation

<p><b>CONSTANT A ERROR</b></p>	<p>Percent error in P due to round-off error in constant A equals: <math>\frac{V-W}{A \text{ calculated}} \times 100</math></p> <p>A Calculated: result of appropriate formula from Table 2-5.  m: 6 minus number of digits to the left of the decimal point in the highest printed value.  V: A Calculated <math>\times 10^m</math>  W: nearest whole number to V</p> <p>For proper decimal point placement, enter A constant = <math>\frac{W}{10^m}</math></p>
<p><b>CONSTANT B ERROR</b></p>	<p>Percent error in P due to round-off error in constant B equals: <math>\frac{B \text{ constant} - B \text{ calculated}}{D^* - B \text{ calculated}} \times 100</math></p> <p>B Calculated: result of appropriate formula from Table 2-5.  B Constant: nearest whole number to B Calculated.  D*: Displayed value ignoring decimal point.</p>



**NOTE**

*If no instrument is connected to the selected SPEC ADR, the words IMPROPER ENTRY will be printed, followed by the SPEC ADR.*

6. INT TRACE - When the f key is pushed, followed by the INT TRACE key, the interval trace print mode is established. The interval trace mode operates exactly as does the trace mode, but trace dots are printed only at the operator programmed time intervals. A timing mark is printed every 60 time intervals.

**NOTE**

*If no instrument is connected to the selected SPEC ADR, the words IMPROPER ENTRY will be printed, followed by the SPEC ADR.*

**2-28. OPERATION**

2-29. Use the following procedure to program and operate the Model 2030A Programmable Printer.

1. Press the POWER ON/OFF key. (See Table 2-5, Initialization Condition.)

**Table 2-5. Initialization Condition**

TIME:	Elapsed Time = 00:00:00
INTERVAL:	00:00:00
HEADER:	
A:	1.
B:	0
MATH:	Reset
HI LIM:	0
LO LIM:	0
UNITS:	Reset
SPEC ADR:	0
PRINT MODE:	Stop

**NOTE**

*Pressing the PAPER ADVANCE key within 1 second of POWER ON initiates the printer self-test function. The 2030A will print a slash (/) in all columns if it is working properly.*

2. Program the desired constants and functions by pressing key f, then the necessary function key, followed by the required value keys. (DECIMAL may be used only with key A; MINUS may be used with key B, HI LIM, LO LIM, or UNITS.) Press ENTER. (Refer to Figure 2-3, Programming Examples.)

**NOTE**

*In programming UNITS, a maximum of three DIGITS may be selected for each of four UNIT codes. The MINUS key is the delimiter; it must be pressed at least once between each three DIGIT code group. Pressing MINUS twice produces a blank space in place of a UNITS annotation. Only one DIGIT may be selected for SPEC ADR.*

3. If additional function and constants programming is necessary, repeat step 2.

4. If no additional function and constant programming is necessary, the TRACE, INTERVAL, CONT, or SINGLE print mode key may be pressed to select those print modes. Key f, followed by either INT TRACE or INT LIMIT may be pressed to program those print modes.

5. To program MATH, press key f, followed by the MATH key. If MATH is required, with INT TRACE, or INT LIMIT, press key f, then MATH, then ENTER. Press f again, then INT TRACE or INT LIMIT.

6. To terminate any print mode except CONT, press key f, then the STOP key. To terminate the CONT print mode, press the CONT key to reset it.

**NOTE**

*When the STOP key is pressed or the CONT key reset, previously programmed constants are not reset. All constants are reset upon POWER OFF, or they may be reprogrammed at any time.*

<p style="text-align: center;">TIME = 12:34:56</p> <p>PUSH                      PRINTER RESPONSE</p> <p>(f)</p> <p>TIME                      RT 00:00:00</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>ENTER                      RT 12:34:56</p>	<p style="text-align: center;">HEADER = 123456</p> <p>PUSH                      PRINTER RESPONSE</p> <p>(f)</p> <p>HEADER                      HD 000000</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>ENTER                      HD 123456</p>
<p style="text-align: center;">INTERVAL = 00:01:30</p> <p>PUSH                      PRINTER RESPONSE</p> <p>(f)</p> <p>INTERVAL                      IT = 00:00:00</p> <p>1</p> <p>3</p> <p>0</p> <p>ENTER                      IT 00:01:30</p>	<p style="text-align: center;">A = 25.4</p> <p>PUSH                      PRINTER RESPONSE</p> <p>(f)</p> <p>A                      A 000000.</p> <p>2</p> <p>5</p> <p>DECIMAL</p> <p>4</p> <p>ENTER                      A25.4</p>

Figure 2-3. Programming Examples

<p><b>B = -123456</b></p> <p>PUSH</p> <p>f</p> <p>B</p> <p>-</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>ENTER</p> <p>PRINTER RESPONSE</p> <p>B 000000</p> <p>B - 123456</p>	<p><b>LO LIM = -123456</b></p> <p>PUSH</p> <p>f</p> <p>LO LIM</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>-</p> <p>ENTER</p> <p>PRINTER RESPONSE</p> <p>LL 000000</p> <p>LL -123456</p>
<p><b>HI LIMIT = -123456</b></p> <p>PUSH</p> <p>f</p> <p>HI LIM</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>-</p> <p>ENTER</p> <p>PRINTER RESPONSE</p> <p>HL 000000</p> <p>HL -123456</p>	<p><b>UNITS = kHz</b></p> <p>PUSH</p> <p>f</p> <p>UNITS</p> <p>1</p> <p>0</p> <p>7</p> <p>-</p> <p>7</p> <p>2</p> <p>-</p> <p>1</p> <p>2</p> <p>2</p> <p>ENTER</p> <p>PRINTER RESPONSE</p> <p>UN UNITS RESET</p> <p>UN kHz</p>

Figure 2-3. Programming Examples (cont)

MATH = SET/RESET	SPECIAL ADDRESS = 8
<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <b>PUSH</b>   <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 5px;">f</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">MATH</div> </div> <div style="text-align: center;"> <b>PRINTER RESPONSE</b>   <div style="margin-top: 100px;">MATH SET OR MATH RESET</div> </div> </div>	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <b>PUSH</b>   <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 5px;">f</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">SPEC ADR</div> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">8</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">ENTER</div> </div> <div style="text-align: center;"> <b>PRINTER RESPONSE</b>   <div style="margin-top: 10px;">SA 0</div> <div style="margin-top: 40px;">SA 8</div> </div> </div>
<p style="text-align: center;"><b>MATH OPERATION</b></p> <p>MASTER EQUATION: <math>P = A (D-B)</math></p> <p>P: PRINTED OUTPUT A: USER CONSTANT B: USER CONSTANT D*: DISPLAYED NUMERIC VALUE</p> <p>TRACE EQUATION:</p> $A = \frac{100}{D_{HI} - D_{LO}}$ $B = D_{LO}$ <p>DELTA EQUATION:</p> $A = \frac{REF}{REF^*}$ $B = REF^*$ <p>% DELTA EQUATION:</p> $A = \frac{100}{REF^*}$ $B = REF^*$ <p>SCALING EQUATION:</p> $A = \frac{P_{HI} \cdot P_{LO}}{D_{HI}^* - D_{LO}^*}$ $B = \frac{P_{HI} D_{LO}^* - P_{LO} D_{HI}^*}{P_{HI} - P_{LO}}$ <p>SCALING EQUATION, <math>P_{LO} = 0</math>:</p> $A = \frac{P_{HI}}{D_{HI}^* - D_{LO}^*}$ $B = D_{LO}^*$ <p style="font-size: small;">*NUMERIC VALUE IGNORING DECIMAL POINT</p>	<p style="text-align: center;"><b>STOP PRINT CYCLE</b></p> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <b>PUSH</b>   <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 5px;">f</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">STOP</div> </div> <div style="text-align: center;"> <b>PRINTER RESPONSE</b>   <div style="margin-top: 100px;">STOP</div> </div> </div>
	<p style="text-align: center;"><b>CLEAR TIME, UNITS, OR SPEC ADR</b></p> <div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <b>PRESS</b>   <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 5px;">f</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">TIME</div> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">0</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">ENTER</div> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">f</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">UNITS</div> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">0</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">ENTER</div> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">f</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">SPEC ADR</div> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">0</div> <div style="border: 1px solid black; border-radius: 15px; width: 80px; height: 30px; display: flex; align-items: center; justify-content: center; margin-top: 5px;">ENTER</div> </div> <div style="text-align: center;"> <b>PRINTER RESPONSE</b>   <div style="margin-top: 10px;">RT 12:34:56</div> <div style="margin-top: 20px;">ET 00:00:00</div> <div style="margin-top: 20px;">UN kHz</div> <div style="margin-top: 20px;">UNITS RESET</div> <div style="margin-top: 20px;">SA 8</div> <div style="margin-top: 20px;">SA 0</div> </div> </div>

Figure 2-3. Programming Examples (cont)